Rishi De-Kayne, PhD

Evolutionary Biologist

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I am a computational evolutionary biologist using genomics to study adaptation, speciation, and conservation biology, with the aim of revealing the origin and maintenance of biodiversity.

EMPLOYMENT:

09/2024-present **Postdoctoral Researcher**
Peter Sudmant Lab – University of California, Berkeley, USA
Project: Structural variation, somatic evolution, and the genetic basis of aging in primates and rockfish

04/2023-08/2024 **Postdoctoral Researcher**
Joanna Kelley Lab – University of California, Santa Cruz, USA
Project: Convergent adaptation to extreme environments in Poeciliid fishes

02/2021-03/2023 **SNSF Early Postdoc Mobility Fellow – Independent Postdoctoral Researcher**
Simon Martin Lab – University of Edinburgh, UK
Project: The evolution and maintenance of wing-pattern supergenes in *Danaus* butterflies

EDUCATION:

10/2016-11/2020 **PhD** – Pass with honours - *insigni cum laude*
University of Bern, Switzerland
Title: The genetic basis of adaptation and speciation in the Swiss Alpine whitefish radiation
Project supervisors: Prof. Ole Seehausen & Dr. Philine G. D. Feulner

10/2015-10/2016 **MRes Tropical Forest Ecology** – Pass with Distinction
Imperial College London, UK
Thesis: Endophytic fungal, not bacterial, communities differ between sympatric palm species
Project supervisor: Prof. Vincent Savolainen

10/2012-10/2015 **BSc Biology** – 1st Class Honours
Imperial College London, UK
Thesis: Resolving the phylogeny of the sharks using 20 transcriptomes
Project supervisor: Prof. Vincent Savolainen

PUBLICATIONS:

I have **17 publications (11 as first author)** in internationally recognised peer reviewed journals with a total of **438 citations and an h-index of 10**. * = joint first authorship, IF = Journal Impact Factor, Outperforming IF = paper citations/year is higher than Journal IF

17. K Ryan, **R De-Kayne**, J Davis, L Arias-Rodriguez, M Tobler, JL Kelley. New genome assemblies for Poeciliidae: A foundation for adaptation studies. Genome Biology and Evolution doi.org/10.1093/gbe/evaf111

16. **R De-Kayne***, S Li*, M Escalona*, RN Lou, GL Owens, SRR Kolora, et al. (2025) A haplotype-resolved genome assembly of the bocaccio rockfish, *Sebastes paucispinis*. Journal of Heredity esaf026

15. **R De-Kayne**, IJ Gordon, RF Terblanche, S Collins, KS Omufwoko, DJ Martins, SH Martin (2025) Incomplete recombination suppression fuels extensive haplotype diversity in a butterfly color pattern supergene. PLOS Biology 23:e3003043

14. **R De-Kayne**, R Schley, JMI Barth, LC Campillo, C Chaparro-Pedraza et al. (2025) Why do some lineages radiate while others do not? Perspectives for future research on adaptive radiations. Cold Spring Harbor Perspectives in Biology 17:a041448

13. M Rincon-Sandoval, **R De-Kayne**, SD Shank, S Pirro, A Ko'ou, et al. (2024) Ecological diversification of sea catfishes is accompanied by genome-wide signatures of positive selection. Nature Communications 15:10040

12. R Greenway, **R De-Kayne**, A Brown, H Camarillo, C Delich et al. (2024) Integrative analyses of convergent adaptation in sympatric extremophile fishes. Current Biology 34:4968-4982.e7

11. **R De-Kayne**, B Perry, K McGowan, J Landers, L Arias-Rodriguez, R Greenway, CM Rodríguez Peña, M Tobler, JL Kelley (2024) Evolutionary rate shifts in coding and regulatory regions underpin repeated adaptation to sulfidic streams in poeciliid fishes. Genome Biology and Evolution 16:evae087

10. J Cerca, DD Cotoras, VC Bieker, **R De-Kayne**, P Vargas, et al. (2023) Evolutionary genomics of oceanic island radiations. Trends in Ecology & Evolution 38:631-642

9. **R De-Kayne**, OM Selz, D Marques, D Frei, O Seehausen, PGD Feulner (2022) Genomic architecture of adaptive radiation and hybridization in Alpine whitefish. Nature Communications 13:4479

8. K-W Kim*, **R De-Kayne***, IJ Gordon, KS Omufwoko, DJ Martins, SH Martin (2022) Stepwise evolution of a butterfly supergene via duplication and inversion. Philosophical Transactions of the Royal Society B 377:20210207

7. D Frei, **R De-Kayne**, OM Selz, O Seehausen, PGD Feulner (2022) Genomic variation from an extinct species is retained in the extant radiation following speciation reversal. Nature Ecology and Evolution 6:461-468

6. KS Singh*, **R De-Kayne***, KS Omufwoko, R ffrench-Constant, C Bass, D Martins, SH Martin (2022) Genome assembly of *Danaus chrysippus* and comparison with the Monarch. *Danaus plexippus.* G3: Genes, Genomes, Genetics 12:jkab449

5. **R De-Kayne***, D Frei*, R Greenway, SL Mendes, C Retel, PGD Feulner (2021) The future of next generation sequencing datasets: technological shifts provide opportunities but pose challenges for reproducibility and reusability. Molecular Ecology Resources 21:653–660

4. **R De-Kayne**, S Zoller, PGD Feulner (2020) A de novo chromosome-level genome assembly of *Coregonus sp.* "Balchen": one representative of the Swiss Alpine whitefish radiation. Molecular Ecology Resources 20:1093-1109

3. **R De-Kayne**, PGD Feulner (2018) A European whitefish linkage map and its implications for understanding genome-wide synteny between salmonids following whole genome duplication. G3: Genes, Genomes, Genetics 8:3745-3755

2. OG Osborne*, **R De-Kayne***, MI Bidartondo, I Hutton, WJ Baker, CGN Turnbull, V Savolainen (2017) Arbuscular Mycorrhizal fungi promote coexistence and niche divergence of sympatric palm species on a remote oceanic island. New Phytologist 217:1254-1266

1. PGD Feulner, **R De-Kayne** (2017) Genome evolution, structural rearrangements and speciation. Journal of Evolutionary Biology 30:1488-1490

PUBLICATIONS IN PREP:

Haplotype-resolved rockfish genomes provide insights into the genetic basis of longevity
R De-Kayne, RN Lou, M Love, GL Owens, W Larson, PH Sudmant

Pangenome-based analysis of structural variants across multiple locally adapted Poeciliid fishes
K Ryan, **R De-Kayne**, L Arias-Rodriguez, M Tobler, JL Kelley

Rapid turnover and recurrent structural variation at the 17q21.31 locus in modern and ancient human genomes, and primates
S Sridharan, RN Lou, S Ferguson, J Rocha, **R De-Kayne** et al.

MEDIA HIGHLIGHTS AND PRESS COVERAGE:

2022 – "Phylogenetic tree reveals: new species of whitefish have emerged in every lake", article by Andri Bryner for SCIENA – Swiss Science Today.

2022 – "Gone but not forgotten: entire radiation retains genomic fragments from their lost sister species", 'Behind the Paper' article by D. Frei for Springer Nature Research Communities

2022 – "Genomics of the Alpine whitefish radiation", 'Behind the Paper' article by R. De-Kayne for Springer Nature Research Communities

2020 – "Entangled Life: How Fungi Make Our Worlds, Change Our Minds & Shape Our Futures", discussion of my 2017 work linking soil microbial community structure to speciation in Merlin Sheldrake's 2020 book.

2018 – "Out of sight, but no longer out of mind – towards an increased recognition of the role of soil microbes in plant speciation", commentary article on my work by Geml and Wagner for New Phytologist.

GRANTS, PRIZES, and AWARDS:

- PacBio SMRT Sequencing grant 2023 – **runner up (Co-I) - funded**
- SMBE Young Investigator Travel Award 2023 **– $3,500**
- SNSF Postdoc Mobility fellowship (18 months) 2023 **– CHF 78,000/~$96,000**
- SNSF Early Postdoc Mobility fellowship (18 months) 2020 **– CHF 73,150~$90,000**
- Best student talk at PopGroup53 2020 – **1st Place - £250/~$335**
- Best conference poster at Biology20 2020 – **2nd Place - CHF 150/~$185**
- Best student poster at PopGroup51 2018 – **2nd Place - £150/~$200**

TEACHING EXPERIENCE:

Stanford University – Structural variants in adaptation
03/2025
Guest lecture: "Supergenes and the counterintuitive role of incomplete recombination suppression" contributing to a three-week course exploring the role of structural variants in adaptation.

UC Santa Cruz – Undergraduate Coding Club
05/2024-08/2024
This hands-on course involved weekly meetings where I taught bioinformatics and general programming skills to 6 summer undergraduate researchers. I established the course and prepared and delivered all course material.

UC Santa Cruz – Undergraduate Genomics Training
05/2023
This course offered an extra-curricular comprehensive introduction to bioinformatics for BSc students, covering a typical bioinformatics project workflow from start to end. I taught general bash scripting, read trimming, and read mapping.

OH-KNOW Bioinformatics Workshop
09/2021
I co-organised this four-day online workshop aimed at teaching the latest k-mer based tools for bioinformatics using high-performance computing platforms. The course was attended by 61 participants spanning 10 different time zones. I organised the logistics of the workshop, designed, wrote, and taught a comprehensive bash scripting course, and assisted with all subsequent teaching topics.

University of Bern – Practical in Aquatic Ecology and Evolution
03-05/2018, 03-05/2019, **and 04/2021**
In this course, students designed their own practical investigation to study the ecology and evolution of fish in Swiss lakes. I assisted throughout the practical, wrote and presented an 'introduction to scientific writing' guide for students, and graded the final reports. In 2021 I provided a guest lecture on scientific writing.

University of Bern – Introduction to R for Beginners
09/2019
In this five-day course, second- and third-year BSc students received an introduction to R. I was a teaching assistant for the course and graded final homework reports.

STUDENT MENTORSHIP:

Co-supervision of Alyssa Pratt – University of California, Berkeley PhD Rotation Student
2025-Present
Alyssa's project aims to identify regions of the genome associated with the evolution of lifespan variation across > 200 primate species.

Co-supervision of Jeremy Davis – University of California, Santa Cruz BSc Student
2023-Present
Jeremy's project aims to identify structural variation between Poeciliid fish species to identify structural variation associated with the adaptation of some lineages to survive in hydrogen-sulfide rich springs.

Co-supervision of Frances Swift – University of Edinburgh BSc Evolutionary Genetics Student
12/2022-Present
In this project, Frances used published Lepidoptera reference genome assemblies to investigate both SNP and structural variant diversity across this clade.

Co-supervision of Sam Mitchell – University of Edinburgh MSc Evolutionary Genetics Student
05-08/2022
This project focussed on understanding the consequences of a population bottleneck using whole-genome sequences collected for African monarch butterflies on the remote island of St. Helena..

Co-supervision of Michelé Leemann – University of Bern MSc Bioinformatics Student
07-09/2021
This project aimed to use existing sequencing data for Alpine whitefish to assemble and annotate the Alpine whitefish mitochondrial genome.

Co-supervision of Romano Josi – University of Bern BSc Summer Research Student
06-07/2017

This research project used diagnostic microsatellites to determine the pedigree of lab-reared whitefish larvae and test for the presence of gynogenetic haploid individuals.

OUTREACH, SCIENCE COMMUNICATION:

- Interviewed 100 PhD students from around the world between 2018 and 2020 as part of my blog PhDetails: phdetails.blogspot.com to promote diverse students in biology.
- Written technical articles about bioinformatics approaches both on PhDetails and The Molecular Ecologist Blog: molecularecologist.com.

ACADEMIC SERVICE:

- Scientific manuscript reviewing for: Nature Ecology and Evolution, Cold Spring Harbor Perspectives in Biology, Methods in Ecology and Evolution, Molecular Ecology Resources, Molecular Biology and Evolution, Zoological Research, Philosophical Transactions of the Royal Society B, Molecular Ecology, Heredity, Genome Biology and Evolution, Evolutionary Applications, G3, Journal of Evolutionary Biology, Genome
- Scientific grant reviewing for: Great Lakes Fisheries Commission.
- PhD and Postdoc representative (Unteren Mittelbau) on the hiring committee for a new Professor for Theoretical Ecology and Evolution at the University of Bern (2019).

INVITED SEMINARS:

15. Evolution at the extremes - the origin, maintenance, and conservation of remarkable phenotypes, SMNS, Germany 07/2025

14. Uncovering overlooked variation - the role of structural variants in adaptation. *Biology Department Seminar Series*, USF, USA 11/2024

13. Uncovering overlooked variation - the role of structural variants in adaptation. *EEOB Seminar Series*, UC Riverside, USA 10/2024

12. The roles of evolutionary rate shifts and structural variation in sulfide adaptation. Humboldt Universität zu Berlin, Germany 05/2024

11. Uncovering overlooked variation - the role of structural variants in adaptation. *EEB Seminar Series*, UC Santa Cruz, USA 04/2024

10. Uncovering overlooked variation - the role of structural variants in adaptation. UC Berkeley, USA 03/2024

9. Adaptation across scales – from SNPs to supergenes and lakes to continents. Stanford University, USA 12/2022

8. The genomic basis of adaptation and speciation in the Alpine whitefish radiation. University of Oklahoma, USA 09/2022

7. Adaptation across scales – from supergenes to adaptive radiations. *MVZ Seminar*, UC Berkeley, USA 05/2022

6. Adaptation across scales – from supergenes to adaptive radiations. *CPB Seminar*, UC Davis, USA 03/2022

5. The genomic basis of adaptation and speciation in the Alpine whitefish radiation. *Next Generation Genomics MSc Course*, University of Edinburgh, UK 02/2022 (**Guest Lecture)**

4. The evolution of complex wing-pattern supergenes in Danaus butterflies. *Lepinar Seminar Series*, Online 02/22

3. The genomic basis of adaptation and speciation in the Alpine whitefish radiation. *COMgen Seminar Series*, University of Nottingham 02/2021

2. Genomic insights into the evolution of the Alpine whitefish radiation. *CIGENE Seminar Series*, Norwegian University of Life Sciences 02/2021

1. From palms to whitefish – understanding the genetic basis of adaptation and speciation. *Eawag Aquatic Ecology & Macroevolution Seminar Series 2020*, Kastanienbaum, Switzerland 04/2020

CONTRIBUTED SEMINARS and POSTERS (as presenting author):

20. The (un)predictability of sulfide adaptation in Poeciliid fishes across scales of biological organization. Evolution 2024, Canada, 07/2024 **- Oral Presentation**

19. Evolutionary dynamics of a modular supergene in the African monarch butterfly (*Danaus chrysippus*). SMBE 2023, Italy, 07/2023 **- Oral Presentation**

18. Stepwise supergene evolution in a butterfly: multiple duplications preceded multiple inversions. *Bay Area Population Genomics meeting XIX*, Stanford University, USA 04/2022 - **Oral Presentation**

17. Stepwise evolution of a butterfly supergene via duplication and inversion. *55nd Population Genetics Group Meeting (PopGroup55)*, Norwich, UK (online) 01/2022- **Oral presentation**

16. A mixed genetic architecture and gene flow facilitate adaptive radiation. *Understanding 'reproductive isolation'? ESEB satellite symposium*, Online 09/2021 - **Oral presentation**

15. Dissecting the evolutionary mechanisms driving Alpine whitefish diversification, *54nd Population Genetics Group Meeting (PopGroup54)*, Liverpool, UK (online) 01/2021 - **Oral presentation**

14. Towards understanding adaptation and speciation in the Swiss Alpine whitefish radiation. *Biology20 Conference,* Freiburg, Switzerland 02/2020 – **Poster presentation**

13. Towards understanding adaptation and speciation in the Swiss Alpine whitefish radiation. *53rd Population Genetics Group Meeting (PopGroup53)*. Leicester, UK 01/2020 - **Oral presentation**

12. A de novo chromosome-level genome assembly of *Coregonus steinmanni* – towards understanding adaptation and speciation in the Swiss Alpine whitefish radiation. *4th International Conference on Integrative Salmonid Biology (ICISB2019).* Edinburgh, UK 11/2019 - **Oral presentation**

11. Genomics of adaptation in the Alpine whitefish radiation - genomic resources to study adaptation and speciation. *2019 Congress of the European Society for Evolutionary Biology (ESEB2019).* Turku, Finland 08/2019 - **Poster presentation**

10. Assembling the genome of *Coregonus steinmanni* – unlocking the secrets of the Swiss Alpine whitefish radiation. *EAWAG Fish Ecology and Evolution Symposium 2019*. Kastanienbaum, Switzerland 07/2019 - **Oral presentation**

9. Towards the understanding of adaptation and speciation in the Swiss Alpine whitefish radiation. *Biology19 Conference*. Zurich, Switzerland 02/2019 - **Oral presentation**

8. Towards the understanding of adaptation and speciation in the Swiss Alpine whitefish radiation. *52nd Population Genetics Group Meeting (PopGroup52).* Oxford, UK 01/2019 - **Oral presentation**

7. The Swiss Alpine whitefish radiation – first steps in understanding the genomic basis of adaptation and speciation. *Programming for Evolutionary Biology (PEB) Conference 2018*. Buttermere, UK 09/2018 - **Oral presentation**

6. The Swiss Alpine whitefish radiation – genomic resources to study adaptation and speciation. *2018 Congress of the European Society for Evolutionary Biology (ESEB2018).* Montpellier, France 08/2018 - **Poster presentation**

5. Producing genomic resources for pre-Alpine whitefish and what they can tell us about genome evolution. *EAWAG Fish Ecology and Evolution Symposium 2018.* Kastanienbaum, Switzerland 06/2018 - **Oral presentation**

4. Constructing a linkage map for Swiss Alpine whitefish. *Biology18 Conference*. Neuchatel, Switzerland 02/2018 - **Poster presentation**

3. Constructing a linkage map for Swiss Alpine whitefish. *51st Population Genetics Group Meeting (PopGroup51).* Bristol, UK 01/2018 - **Poster presentation**

2. Investigating the genomic basis of adaptation and speciation in the Alpine whitefish radiation. *EAWAG Fish Ecology and Evolution symposium 2017.* Kastanienbaum, Switzerland 06/2017 - **Oral presentation**

1. The genomic basis of adaptation and speciation in the Swiss Alpine whitefish radiation. *Biology17 Conference.* Bern, Switzerland 01/2017 **Poster presentation**